FROM IMMATERIAL TO

TANGIBLE

The Digital Photograph as a Hybrid Piece of Art

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ABSTRACT

This text describes some possibilities of expanding the materiality of a digital photograph, using digital fabrication tools.
The goal of such expansion would be to widen the perception of photographs as art pieces.
The post-digital is being reviewed as the current context for any artistic work, which would be interested in integrating the digital domain into the physical.
The main proposition is that embracing the manipulability of digital photography, and adding physicality to it, could enable the development of novel types of hybrid interdisciplinary artworks. These pieces could dissolve further the traditional divisions between artistic mediums.
The topic is examined in practice through three personal works of art, created in the period 2015-2017.
Experimentation with 3d printing, CNC-millng and mixing digital photography with basic electronics lead to the realisation of the pieces.
Additionally, describing and analysing the process of their creation could help outline the role of technology in shaping the final appearance of such a hybrid artwork.

photography, hybrid, digital fabrication,
post-digital, physicality, materiality, experience art

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CONTENTS

INTRODUCTION

This text is a reflection of the development of three artistic projects, created in the period 2015-2017. A detailed overview of the projects is presented alongside an observation about the aesthetic context and other artistic explorations regarding the main topic of interest.

Background

When I started my artistic explorations in photography around 2010, the digitalisation of the medium had already happened. I did not need to go through the shift from analogue and I did not see the analog tools as necessarily superior — a viewpoint shared by many photographers. Digital photography has many improvements in comparison, some of them being the faster process of production, the lower overall cost of the whole process, the more effortless and rich possibilities of post production. Using digital photography as a starting point for my work has become my preferred approach.

In the three works, described in the further chapters, I have also drawn upon my artistic background before my encounter with photography - the sculptural viewpoint of porcelain/glass BA degree. The common ground between the two areas was found through some of the tools of new media, and more precisely — digital fabrication. The result was a variety of image-(sculptural) objects.

The process has gone in different directions — physical stretch, potential haptic expansion, and development in the possibilities of interaction. Creating visuals of the unseeable, imagining the possible touch of the untouchable, adding new layers to the already established has become my light motif. I have been searching for the conceivable alternatives in any direction.

Questions

The main point at which this work was commenced was the question of expanding the physicality of photography. The goal was the creation of hybrid pieces, which would broaden the understanding of what a photograph could be. Using the data, which digital photography would provide aided exploring various directions, such as converting the digital information into volume and texture. The photograph needed to embody a novel physical shape. It was important to observe the various transformations of the digital image into the physical space. Enabling the photograph to be perceived in more respects, including more senses than just sight, was a high priority.
Could an image be a physical experience?

Throughout the development other questions occurred. The issue of the compositional content of the photograph has always been significant. I was particularly interested in discovering to what extent the subject matter could be defining when creating such hybrid works.
What connection could the content potentially build with the physical shape of the image, and was it substantial in this

case? The two would inevitably be linked together and not characterised as separate entities.

The role of light has been continuously discussed as well, when referring to photography. It was another point of inquiry in this exploration. How could light contribute in the creation of the image-body after the moment of taking the picture?

Ultimately — what was the function of technology? It undeniably affected the process in all respects. It was a major factor enabling the production of the pieces. The question of who holds the control — the author or the machine, occurred at times. Nevertheless, I regard technology as a tool and not an end goal.

Approach

The current exploration was entirely situated in the practice. The approach towards the work has been highly experimental, following the idea of combining areas which are not generally linked together.

The works were created through an integrative arrangement — the digital photograph was transformed into a unified piece of different layers — volume, transparency / solidity, interactivity were subsequently added.

Framework

After the initial introduction, the chapters deploy the topic as follows:

Chapter 2 is a mapping of theoretical views regarding the digital image and photography in general, defining some key terms, and focusing the attention to the post-digital.
In chapter 3 the main focus falls on aesthetics. A few concepts, related to the main works described in this text, are considered.
Chapter 4 marks a few past and ongoing artistic practices in the physical side of a photograph.
Chapters 5 and 6 gather the documentation part of the three projects, which constitute the practical side of this thesis. The analysis, from tracing initial ideas, decision making to actual realisation is split in two, as the first part examines one path — using the image's information to build the physical shape. The second part deals with the addition of interaction, its contribution to the transformation towards a hybrid image-object.
The last chapter serves to draw conclusions and eventual plans for further development of the topic.

The image is no longer the accomplishment of the artistic gesture, it is an instant in its birth.

Maurice Benayoun

THE POST-DIGITAL COMPOUND

> Thus the new photographic discourse, both within its stereographic virtuality and its hypermedia potentiality, must put as much emphasis on the behaviour of the viewing subject, her interaction with the apparatus and the image, as on her introspective re-action. The window onto a world of analogue actualities gives way to the doorway into a world of digital potentialities.
>
> Roy Ascott, (Ascott, 2003, p.251)

The Photograph as a Digital Image

In order to avoid any speculation on the matter, clear definitions of digital photograph and digital image are necessary.

Lev Manovich claimed that "digital photography does not exist" (Manovich, 1994, p.3) and disclosed different paradoxes of the digital images, proving that it is not that radically different from classical photography.

Both he, and Bolter and Grusin (Bolter & Grusin, 2000, pp. 106-112) challenged William J. Mitchel's differentiation of photography vs. digital image, and persuasively demonstrate that a very strict separation between the two is unfounded.

For Bolter and Grusin, it also seemed nonessential whether a photograph is taken by a digital camera, or by an analog one. The illusory relation of the photograph to reality and truthfullness is the same for both, as is also the viewer's desire for immediacy (immediate contact with reality).

The conclusion which could be drawn from these texts, and what is already been established as common sense is, that a photograph is an image, taken by a camera and recorded onto a light-sensitive material – chemical process based film or plate, or digital sensor. In the case of the latter, a digital image could be used as a synonym of photograph. However, it should be noted that they are not completely interchangeable, as the digital image is a broader term – it constitutes of a binary, flat shape / representation in electronic format, not necessarily shot with a camera. Vector images and all kinds of other computer generated graphics are also digital images in their essence.

Still, generally, and in this text, it is considered that digital image refers to a digital photograph. What is important here, is to examine how the qualities of the digital image could be useful in an artistic practice. Bolter and Grusin ponder upon the subject of photo realism and photographic truth (Bolter & Grusin, 2000, p. 106), but that doesn't concern any practice whose aim is beyond the mere reflection of reality.

In fact, the biggest artistic power of the digital image is its nature of being a sum of numbers, a set of information which could be manipulated beyond recognition. At no

time has there been such an extensive liberation in photography. Just as chemical photography freed painting from the responsibility of figurative representation, digital photography manipulation emancipated art photography from the same obligation.
At this moment I am able to take a picture and produce a sound out of it, or a sculpture, or a generative, never ending mesh of lines and colours. Jos de Mul calls this quality "digital recombination" (Mull, 2009). For Peter Weibel, "the image is a dynamic system" (Weibel, 2005, p.181).

While there are many possible paths along which this system could be developed, for the three artworks described in this text (chapters 5-6), it is the translation of the information from the digital domain into the physical.
This path of translation characterises one specific aspect of contemporary art discourse – the post-digital.

What is Post-Digital?

The second half of the 20th century is the time of the conversion from mechanical media to digital electronics. In photography the process has run as a major shift from the use of chemical processes to mathematical structures.
The initial excitement about digital technologies and the high expectations about their impact on people's lives, however, have surpassed their peak and have become more moderate since.
"Face it – the Digital Revolution is over."1

1. www.wired.com/1998/12/negroponte-55/

In the current state, the post-digital comes into place. Not meaning *after* the digital, but rather – *beyond*. The digital field is no longer an emerging phenomenon causing pure fascination, but an everyday event for most.

The term *post-digital* was coined first in the context of electronic music as a statement against digital perfection in sound production. The same meaning has sometimes been applied to visual art as well. Since then, however, the post-digital has widened its definition. Very accessibly described by Florian Cramer (Cramer, 2013), this is still a term used for different meanings in different occasions, often mixed with other similar phrases such as post-internet or post medium. Thoughts about the post-digital were shared at Transmediale already in 2014[2].
It has become a term which aims to map living "in between" the physical and the digital. It's a way to parse the conditions in which artists have the ability to utilise the digital tools, without being dazed by them.

The post-digital encompasses artworks which have their roots in the digital realm and couldn't have been created without it, but sill could embody some physical shape. Technical innovation is not craved as much, rather, converging it to a more humane state is more important.

An example from Finland, for a discussion ground for the post-digital is the podcast *Postman,* by Tomi Dufva. In an ongoing series of talks with various artists Dufva examines

2. https://transmediale.de/content/afterglow

the topic from different angles. In the very first of his conversations, guest artist Tuomo Rainio shares his views about the post-digital. Rainio works in the direction of expanding photography by using the data from the digital photographs. “Data is a material for artists”[3].
His approach is, nevertheless, different from the one, proposed in this text. He disregards the theme of light and focuses rather on the picturing of movement, manifested in projections, videos and mesmerizing digital collages.
Still, he talks about the idea of hibridity, where a person cannot really divide by analog and digital, interested in translating the data in a physical space and physical material.

The Materiality of the Digital

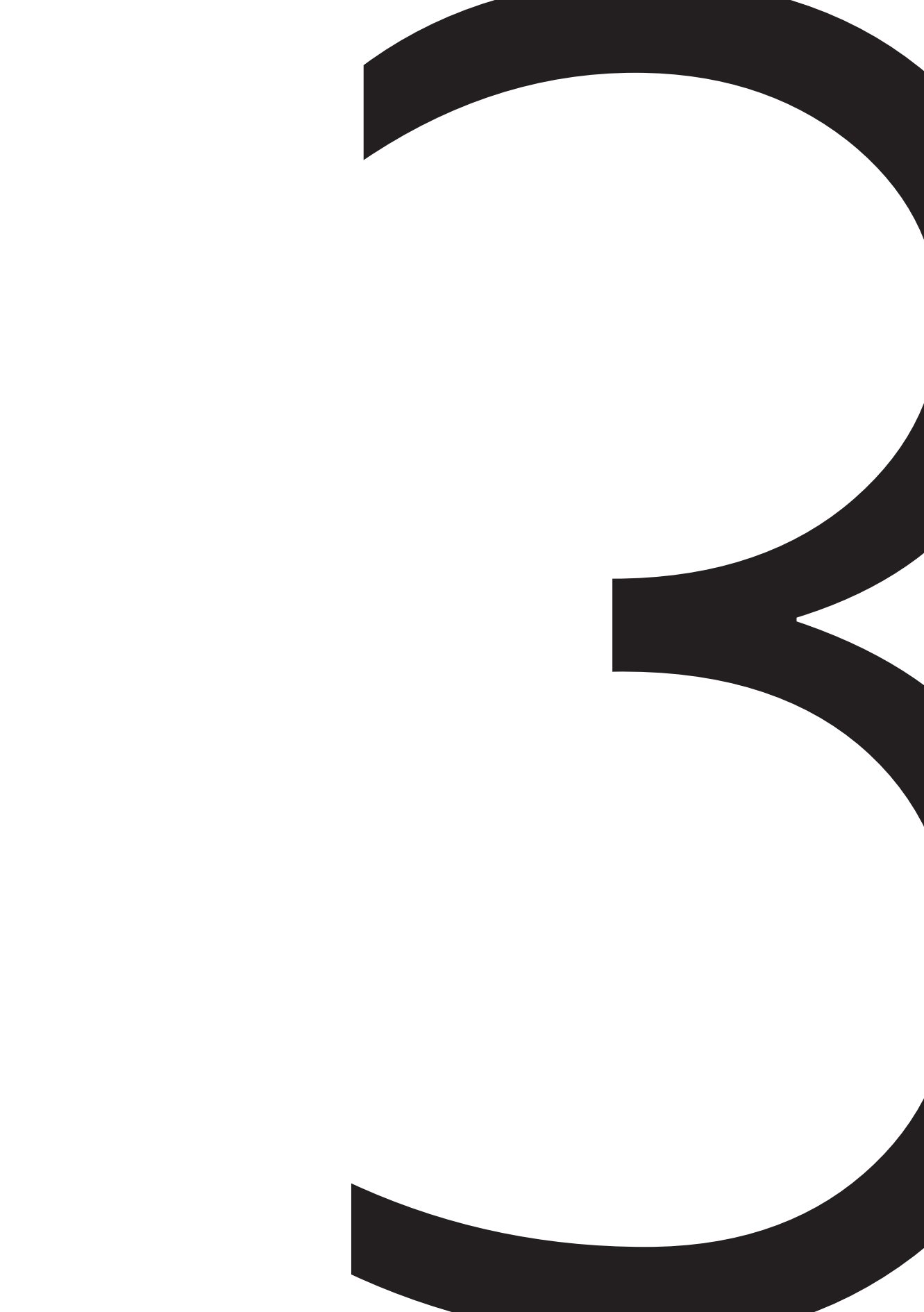
These cases when the digital (data) is brought back to people in a physical form to show the role and influence of technology in art, are called by Christiane Paul “Neomateriality”(Paul, 20015).
They present the digital as embedded in the final art object, inseparable from it, and necessary for its creation. The numbers and algorithms, which are at the core of the piece, often become the structure of the final shape.
This process concerns not only the act of materialising, but also some observations about the ways technology shapes (restricts) the final visual form.

The idea of “neomateriality” is applied also to two of the

3. http://www.thispagehassomeissues.com/blog/2018/3/12/postman-a-new-podcast-on-art-and-postdigital-culture

projects, described in chapters 5-6. Explorations in this direction are useful for at least two reasons. Firstly, artworks which deal with the topic could raise questions about the role of technology in people's lives not only from the perspective of excitement, or, going to the other extreme and envisioning dark future-techno-dystopias, but also commenting how the digital domain is framing and perhaps even guiding our everyday decisions. Testing possible constraints of this "neomateriality" would be another point of interest in the works.

Secondly, from a purely aesthetic point of view, finding new ways of visual expression could only enrich people's perceptions and ways of viewing the world. One particularly interesting element would also be the possibility of creating multi-sensory experiences based on photographs.



AESTHETIC DIRECTIONS

Experience

In a general, classical sense in terms of aesthetics, the visual art piece is an object intended to be perceived through distanced observation.
Philosopher John Dewey, challenged this view already in 1934. He stressed on the importance of experience in shaping the views of the individual person, and on art as one channel for a compressed and intensified experience.

The art, according to his views, is not only the object of creation, but also the act of it's perception, reception and altogether - the experience of this object.
In order to have An Experience (the intensified experience which art provides), one has to perceive and understand the processes of creation of the work, and Dewey points out that "receptivity is not passivity" (Dewey, 1934, p. 54), it is already a process of interaction of the viewer with the piece.

Furthermore, another main proposition of his was that art should not be positioned as a separate domain, but as an integrated part of living (Dewey, 1934, p. 10).
Dewey is "naturalising" the art encounter, humanising this process.

Embodiment

Dewey's aesthetics find common ground with another influential philosophical figure - Maurice Merleau-Ponty. Merleau-Ponty's main interest was also the essence and meaning of experiences. What is more, they both renounce the mind-body dualism.

Merleau-Ponty (1964) engages the body with perception and consciousness, and expresses the view that it is the body, where rationality is rooted. Through the notion of vision, and using the context of painting, Merleau-Ponty explores the relation of objects and their perceived image and establishes the view that all knowledge is completely human-based, person-based. It is our perceptions, which guide our thoughts.

The French philosopher is also concerned with the connection of the body with its surroundings. "Man is a mirror for man" (Merleau-Ponty, 1964, p.130).

In this framework, the experiences we have, which are inevitably connected to our surroundings, are conditioned by our perceptions. Our perceptions, on the other hand, are based on the sensory information which we constantly obtain. Eventually we construct interpretations and meanings fundamentally, resting on our senses.

Following this line of thought, it would seem reasonable to conclude that artworks, which incorporate more senses, would have a larger potential to become experiences.

Interaction

What makes an art piece interactive? For Dewey, even the moment of encounter with the artwork already presupposes interaction.
Manovich calls it "psychological interaction" whenever the viewers are supposed to fill in by themselves some missing or hidden information in the work (2001, p.71). It was suggested already by Duchamp that the viewer was needed to complete the concept of the work (Rush, 2005, p. 183).

However, interaction could be thought of from the perspective of physically involving the viewer and asking for action on their behalf. The viewer is turned into a participant, "co-completer" of the work, and the time of their encounter is crucial for both.

Katja Kwastek (2013) examines interactive art from that standpoint. She draws on views from a number of theorists. She sees interaction in art as a process of knowledge sharing and creation, and puts the body of the viewer in a paramount position relative to the artwork.
"Interactive art places the action of the recipient at the heart of its aesthetics" (Kwastek, 2013, xvii).
It is a cross-disciplinary approach challenging the classical manner of having aesthetic distance with the art piece.
Still, Kwastek does not put in opposition interactivity and observation. For her, they do not necessarily contradict each other and the same artwork could possess them both. In fact, having these different potential modes of perception, a work

would have a better possibility for knowledge creation and sharing (Kwastek, 2013, p. 97).

The current context is narrowed down to one example of visual art. In one aspect, interaction occurs already in the production stage of the work – interaction between the artist and the technology. That process develops into another implementation of interaction – that of the viewer with the work.
The piece *Embodied Images* (chapter 6) requires active participation from the audience for a richer experience.
In the same time, it is a materialised form and could be perceived also passively.

4

THE MATTER WITH PHOTOGRAPHY

When planning of transforming that set of numbers into a solid physical material, it could be useful to trace some past research in the physicality of the picture. Materiality in relation to the understanding of the image itself, has very rarely been a point of interest. There has been a lot written about the specific chemical processes of production, but the focus has been rather on the historical development of those processes or the issues of preservation over time, not necessarily on their importance to the photographed subject matter.

The materiality of an image could be explored in two directions: 1) in the specificity of the materials used for creating the physical object of an image, and 2) in the way of displaying it - from the classical hanging on the wall to taking space like a piece of sculpture.

Fig. 1
Robert Heinecken (1967)

In the Past

Giving the photographic image a concrete physical artistic form was first a topic of interest in 1970 in MoMA, New York. The exhibition, called simply Photography into Sculpture included more than 50 works by various artists. From the press release[1] one becomes acquainted with the intentions

1. www.moma.org/documents/moma_press-release_326678.pdf

Fig. 2
Andre Haluska (1969)

Fig. 3
Marcel Duchamp
(1915-1923)

Fig. 4.1, 4.2
Amanda Ghassaei (2014)

Fig. 5.1, fig. 5.2
Lorna Bradshaw (2013)

of the director of the exhibition, Peter C. Bunnell, to stress the new dimensionality of the photographic image. At the time, however, the focal point of the works gravitated mostly around the craftsmanship of the sculptural arrangement.
Robert Heinechen's work (fig. 1) plays with the idea of the Rubick's cube which suggests that the work should be touched and arranged in a "correct" order. This is an early and ingenious example of a haptic photograph.
Andre Haluska had a different method of manipulating the photograph (fig.2). Turning the image into a collage resembles Duchamp's The Large Glass (fig.3), and also creates depth. Nevertheless, it doesn't completely go out of the frame.

What is described as "landmark 1970 exhibition"[2] for the field of photography, in 2011 was shown again in Los Angeles, containing most of the original works.

In the Present

Current means of technology seem to have evoked again this niche topic of interest, bringing new possibilities.

2. www.cherryandmartin.com/exhibitions/96/31

3d printing is widely used as a tool for sculpting photographs. From Lorna Bradshaw's self-portrait series *Replicants* (fig. 5.1 and 5.2) and Amanda Ghassaei's (fig. 4.1 and 4.2) or Sandra Canning's lithophanes (fig. 6.1 and 6.2), to Richard Dupont's full scanned and printed body (fig. 7), they all pursue novel forms of expression transforming the digital image. Ghassaei's and Canning's pieces relate to Haluska's collage in a way, that they could all be considered sculptural relieves. Bradshaw's faces and Dupont's full body shape are fully detached from the wall and already occupy the third dimension, barely reminding that their starting point was a photograph.

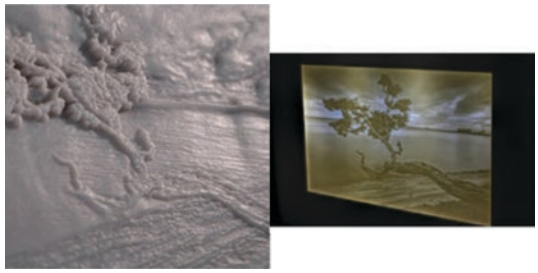


Fig. 6.1, fig. 6.2
Sandra Canning (2014)

Fig. 7
Richard Dupont (2014)

Fig. 8
Artie Vierkant (2015)

Whereas, in the MoMA exhibition from 1970, some works might still retain a visible connection with art history, it seems that in these more recent explorations that hasn't been the objective, and the shape has rather followed the natural physicality of the photographed subject. The new possibilities of manipulation, given by the development in technology, allow for freer use of deformation of the forms. It is very clear to notice this change when looking at the works in the original Photography into Sculpture, and afterwards examining the newer pieces mentioned here. When using classical chemical photography, one is able to create

montages in the process of developing the photo, or later - by cutting pieces out of the physical print and rearranging them anew(as, for example, in the case of Andre Haluska's work). With the tools of alteration of the digital image, however, the artist has the freedom to literally take any part of the photographed subject and stretch it in space.

Yet another direction is taken by Artie Vierkant in his ongoing project Image Objects - series (fig.8), which is fully abstract and manipulated beyond recognition. In his work the concrete subject of a photograph is fully dissolved and deconstructed. The sculptural properties of Image Objects are achieved by the aluminium dibond structure, usually used for back mounting of photographs.
Although conceptually tied more to the contact of the image to the online space and the consequences of involving the Internet in the process of creation an art piece, Vierkant finds it important to give the image a physical shape as well.

ADDING DIMENSIONS

The three works, described in the current and the next chapter, are rather different in their visual appearance and conceptual concerns. What binds them together is the conversion of the digital into the physical, thus positioning them in the post-digital context.

They are thought of first and foremost, as aesthetic experiences. The aesthetic in the process of production is also taken in consideration.

The works are presented in a chronological order. Adding different components in every transformation traces the quest for new materiality of the photograph.

The Journey of Light: Colour turned into volume

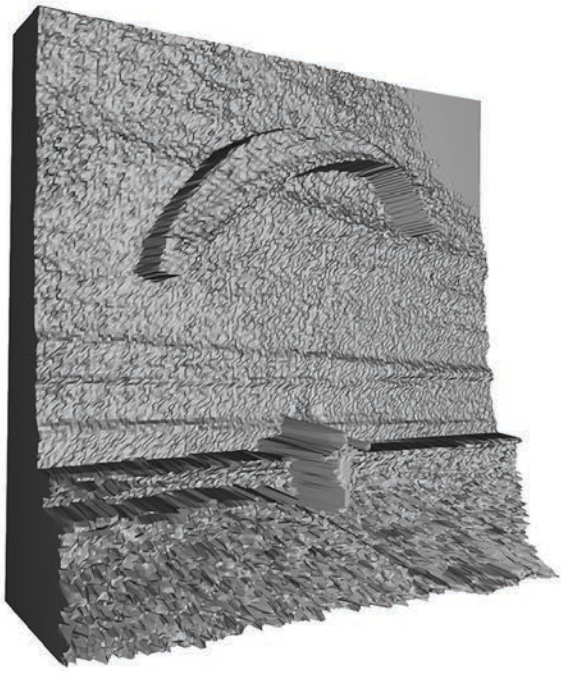
My first inquiry in this direction was the piece called *Another Dimension*. It consists of five 3d printed digital photographs. Inspired initially by the lithophanes of Amanda Ghassaei and Sandra Canning, my intention was to take the images further and achieve more physical depth.

Throughout the process of creating the pieces, many decisions were made intuitively and the course of thought has not been clearly linear. The process itself was significant, the difficulties which had to be overcome, the paths to be taken as a result of those difficulties. In a way, it involved sharing the control over the work with the chosen

technology.
In this piece, I took the information which light had provided in five snapshots, and translated it into five new entities. Colour turned into volume.

This shift also mapped the journey of light, all throughout the development. At first, the original photograph recorded it. Light gave the initial sketch of what was to become the hybrid object later. The precise moment of taking the shot already specified the contours of the future shape. The preparation of the 3D model followed the path of light and dark areas. The amount of volume and the direction of the positive/negative movement of the shape, however, were an object of negotiation and specific settings. This was the point where I had the agency to manipulate the structure to my preference before I gave the control to the 3d printer to materialise the piece. The final relief did not necessarily follow the "real" physical conditions of the moment when the picture was taken. It was one interpretation of what could be multiple different views of the subject.
By chance or not, the printer used light yet again - UV light, to solidify the liquid transparent resin.
Once the final shapes were ready it seemed that I had no other choice, but to emphasise the main component of this work - the light. Thus, the way *Another Dimension* was displayed was through every piece being lit from the back. More contrast was created and the shapes became more visible.

The key objective of this work was the transformation of



Another Dimension: phases of production of the work

light into a solid physical mass after the moment it had been captured in a digital photograph. It was a conscious decision not to follow the logic of that transformation in a straightforward manner.

The Role of Technology

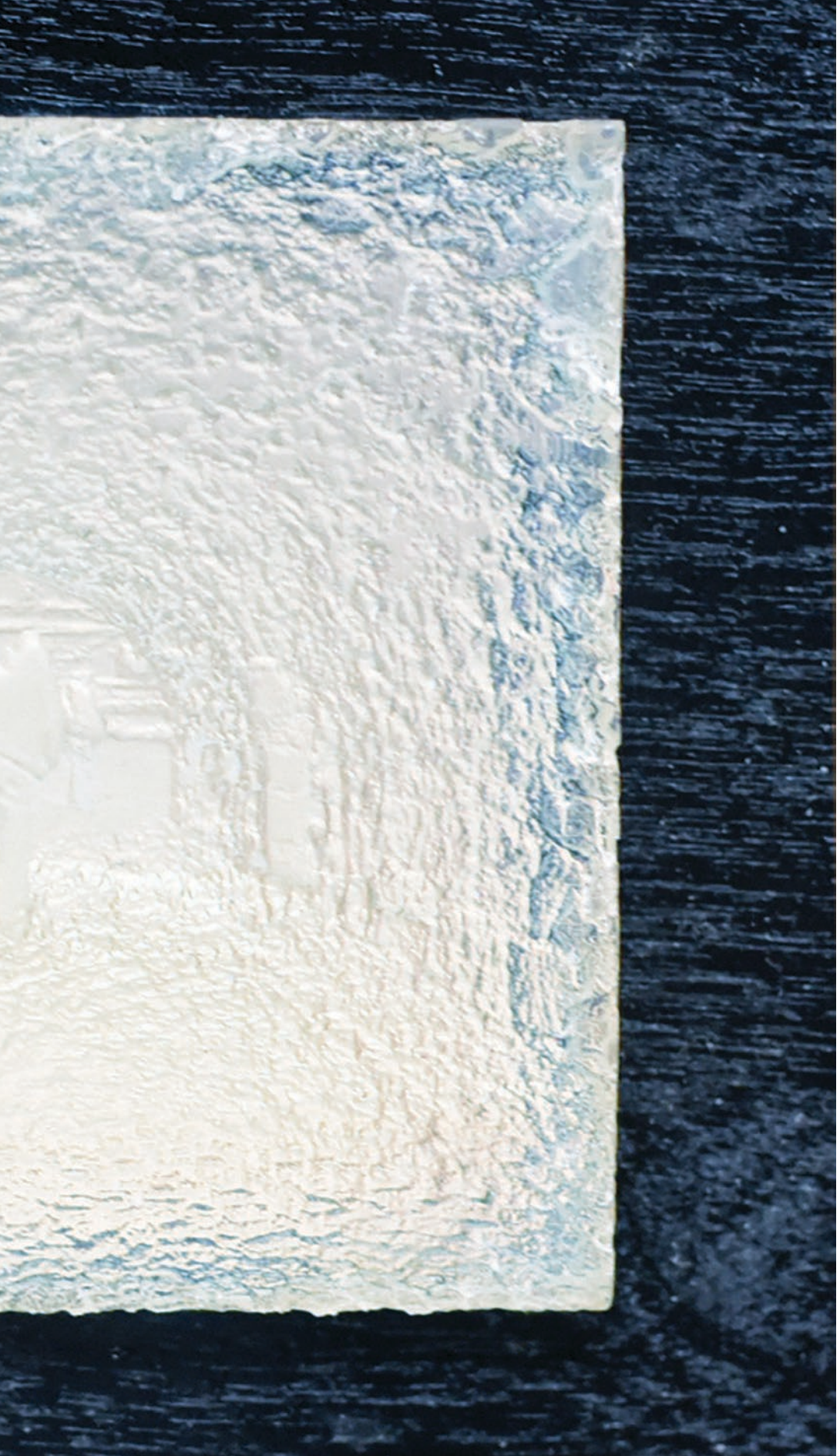
The way the technological restrictions have influenced some of the decisions and the final appearance of this piece, is mostly related to the size of the prints. Using precisely this printer (Formlabs 2) restrained the maximum possible size of each object to the current 7x7 cm. One way to evade that would be to make the work modular and print one fragment at a time. Then, however, there would be the risk of a "tiles" look, pushing the attention in a different direction. Having the whole image in one piece, I would consider important for the holistic perception I was after.

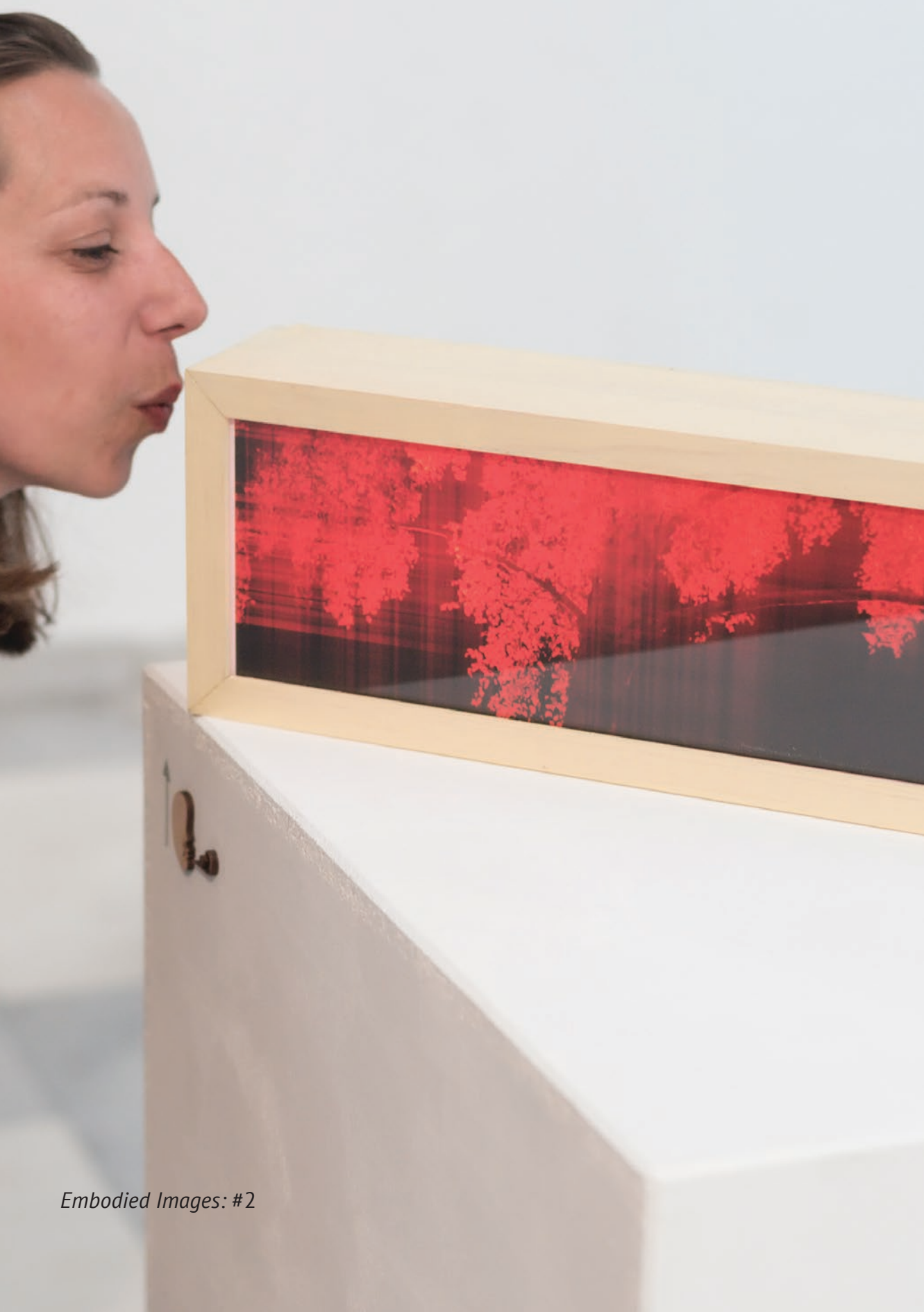
Additionally, many test prints had to be made, until the shape was achieved correctly. This specific printing technology seemed to favour lightweight shapes, since they are gradually moved and hardened upwards. During the printing process some of the *Another Dimension* models were too heavy for the supporting structures and fell, so the operation had to be repeated. Creating more dense supports wasn't an option in this case , for it would have destroyed the fine detail.

The great amount of detail which helped create a more compelling visual result, was one big positive ability of the printer. Being able to print a semi-transparent mass was

another advantage, since adding a specific colour might have added an unnecessary layer of symbolism to the work.

Light set the conditions, consequently my intervention added a certain direction to the development of the work. Eventually the features of the printer co-defined the final outcome.





Embodied Images: #2

ADDING SENSES

Creating a Tactile Experience

The other piece which turned the digital image into a physical volumetric object is *Meet Aurora*. It depicts Aurora Borealis, a phenomenon generally seen a most extraordinary experience. *Meet Aurora* is presenting the audience with this rarity in yet another, tactile way.
The piece was aiming to enable an impossible action – touching the Northern Lights.

This is how the idea of the work was conceived. Sharing my personal encounter with Aurora Borealis, with the final goal being the creation a haptic experience, not just a figure to be observed. After having started *Another Dimension* already, I took a similar approach with this work.

The digital photograph of Aurora Borealis was turned into a set of high-low black and white points with the help of the 3d software and sent to the CNC-mill to be carved in a piece of wood.
This time, transparency was of no importance to the final outcome, people were supposed to see the work undoubtedly, but more importantly - they were to use their sense of touch. The emphasis fell more to the sturdiness of the material rather than the observability. In a way this could be considered the transitional artwork between *Another Dimension* and *Embodied Images*, because it has an added volume, but also an added sense – touch. Even though the

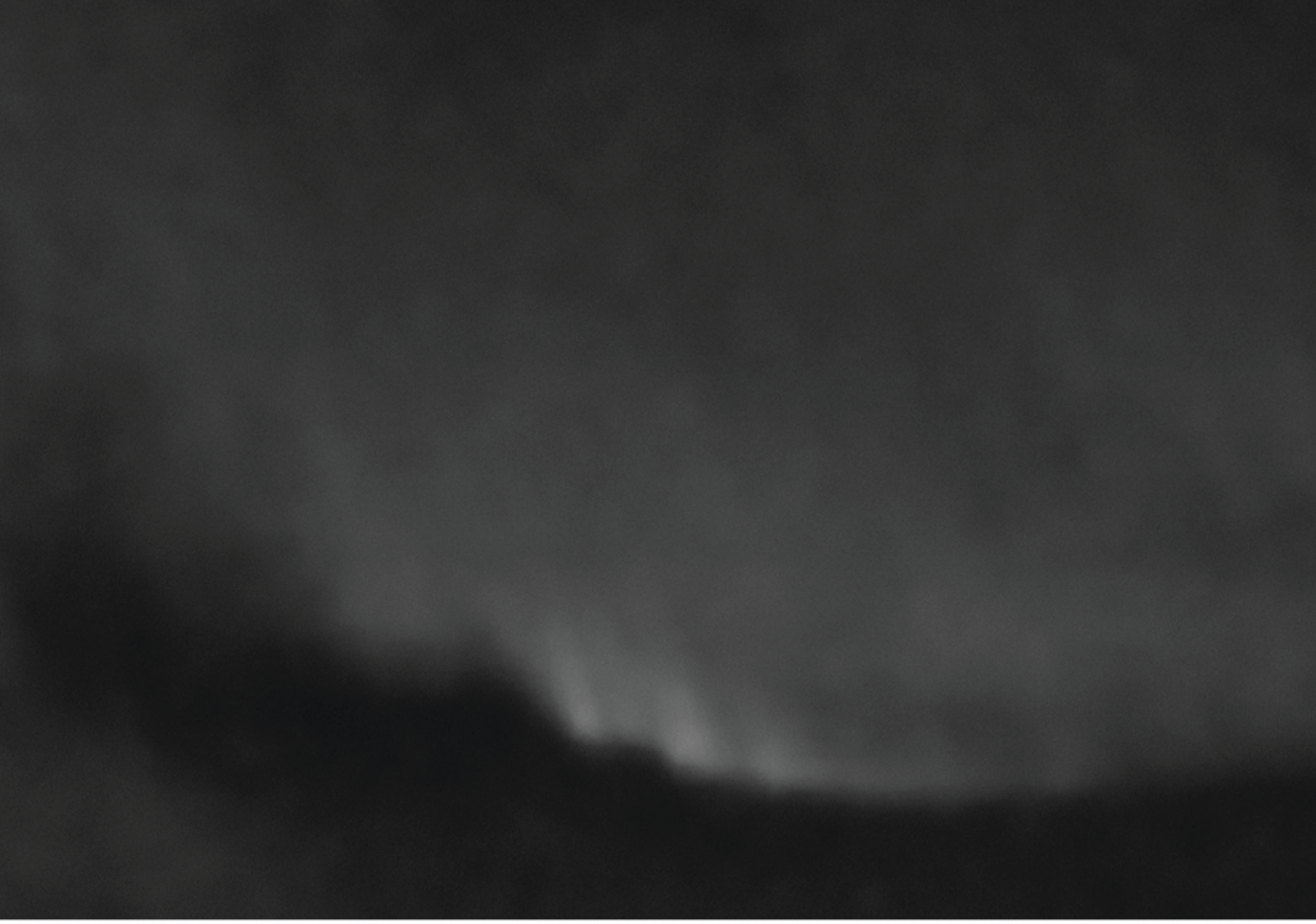
piece does not provide any visible feedback to the audience, they could perceive it in this second sensory level.

Original Aurora Borealis's colouring was omitted, but sight was not excluded in the display of this work. The photograph was exhibited alongside with the wooden representation in favour of clarity.

The role of light in *Meet Aurora* was clearly crucial – in a way perhaps even more than in *Another Dimension*. In this case light was the main subject of the image, in addition to being a contributor to the creation of the final shape.

In the Process

It was possible to achieve a version of the planned form. The final piece appeared to be smaller than initially planned, due to the excessive amount of hours needed to cut the shape in a bigger block of wood. The model also needed to be simplified nearly out of proportion for the same reason. Furthermore, a lot of manual retouching had to be done as a result of the machine breaking down in the middle of the cut and because of time limitations.
CNC-milling provided for immense experimentation with shaping harder materials, but it did not seem suitable for more complex forms. Altogether, technology had more control over the appearance of this work than intended.



Meet Aurora: phases of production of the work

Embodied Images is a series of interactive photographic light boxes and it is the work which adds yet another notion to the process of expansion of the digital image. Both sculptural and in the same time closer to a classical way of displaying a photograph, the series realises five images inseparable from their "frames". Through different types of sensors each image has a different interaction possibility. A work, which provided inspiration along the process, was Robert Rauschenberg's Soundings (1968). In that piece Rauschenberg was inviting the viewers to co-create the images using their own voice[1].

The main objective was the creation of a complete object, and an encouragement to perceiving the image in relation to its "shell", not only as a framed representation of a physical scene. "Embodied" in this case should refer mainly to the photographic image as given a complete 3-dimensional physical body, but it could also be seen as enabling the body of the viewer to participate more fully in the implementation of the work itself.

The choice of photographs was not based mainly on their content, but rather on their ability to be linked to a certain sensory interplay. There is a subtle link between the depiction in the image and the interaction in each box. The goal was for the viewers to be able to imagine a possible subsequent image based upon the current one and

1. https://www.moma.org/documents/moma_press-release_326588.pdf

influenced by the interaction with it. Thus people would have the liberty of creating possible storylines themselves. Alternatively, the work could be seen as five separate fragments, and be centralised more around the feel of the interaction, the aesthetic experience that such a work could provide.

In conjunction with the other layers, light continued to be part of this project as well, literally in the background. It was the change in light which gave visible feedback and completed the process of communication.

Although the images are still, the physical interaction added the element of time to them, yet another facet which could affect the perception of the whole piece. The viewer needed to take time to explore the pieces and to find out how they would respond to the touch, sound, or simply movement.

Embodied Images in Details

#1

Panoramic view of a place. A long walk along the shore.
The image (as well as the other four images) is modified by an algorithm to spill light through vertical lines in a randomised manner, defined by the program.
The viewer could observe the whole piece from a distance, but if they approach, they would have to take a couple of steps along the shore as well. A thermal sensor tracks them by their emitted heat and lights up only those regions, to which the viewer is standing close.

#2

Branches of a tree in the dark. Notion of the wind going through them. The viewer can try to act as the wind, blowing to the left side of the box. A sound sensor gets the signals and light appears according to the strength of the blowing.

#3

Out of the nature, but still carrying it with us. The horse-headed “party animal” prompts the audience to a playful touch. Capacitive sensors dictate the lighting of left/right or both sides of the box.

#4

Not so busy street. If anyone would come across it, they will cast a shadow on the light, coming seemingly from the car. IR distance sensor collects the data from the passers by.
This box works in reverse to the others. In the rest four the audience is responsible for turning the light on, but here they turn it off with their presence.

#5

One can hardly recognise the subject matter. The touch sensor is so big, it covers the whole Ferris wheel. This box might be considered a Ferris wheel for the finger, because only rotating it along the sensor, will the light shine through.

All five light boxes could be perceived without the interaction they enable. The viewer is free to choose their preferred way of communicating with the pieces.

#1

#2

#3

#4

#5

Question of Control

In this series the control over the final outlook was not affected much by technology. The small size of the electronic components and Arduino boards allowed for covering most pieces and bringing forward the images themselves. Still, in some cases the sensor needed to come to the front in order to enable the interaction, and thus inevitably attracted a lot of attention.

The Arduino platform, famous for being very flexible, is incorporated in a huge variety of projects, adding a lot of possibilities. It enhanced *Embodied Images* in a different direction than *Another Dimension* and *Meet Aurora* and this way opened a door to one more route of expanding the photograph.

CONCLUSIONS

Approach

My approach towards the works and their creation was inevitably eclectic. I see many benefits in integrating different tools simultaneously rather than having one "pure" medium. Combining different means gave me the opportunity to push the boundaries of a digital photograph further than I had anticipated, and opened up a huge field for other experiments.

With the post-digital context in mind, I reckon the pieces touch on the human side of technology and emphasise the importance of the main receiver of the work - people. Further research in these hybrid forms of existence would only lead to an expanded perception of art pieces and, eventually, extend the imagination both of the artist, and of the audience.

I was working towards broaden the realm of reality, not simply reflecting it. In that pursuit, I consider I made some progress. By giving the digital image a volumetric material body I encouraged intensifying the sculptural possibilities of a photograph and its potential to become an enriching experience.

Throughout I included light as a main participant and ingredient in the creation of the works. My focus in my previous work was not necessarily pointed towards light, but

I see that as an area with potential for further advancement.

Presentation and Reception

All works were presented to the general public in Sofia, Bulgaria, in two separate exhibitions. The way they were displayed determined to a degree their reception. The series *Another Dimension* was mounted on a wall. In a way, this work wasn't a complete physical experience. It was partly enclosed by its frame and did not include any additional sensory perception possibility, apart from sight. *Another Dimension* provoked the most questions about the detailed ways of production and the use of technology.
There was a lot of interest and people seemed generally intrigued by the appearance of the pieces.

All works seemed to be appreciated for their aesthetic qualities both by the public, and by the curators. However, one issue which arouse was the interaction side of *Embodied Images*. People enjoyed playing with the sensors very much, but it appeared that the pieces carried the element of gamification to an excess. For any future development I would rather have the interaction of such a work more subtle, and not immediate.

Thoughts about the Future

Over the course of this exploration I became convinced in the importance of this topic for my practice and I will continue materialising the digital in a larger body of work.

Specifically regarding *Another Dimension*, in future projects

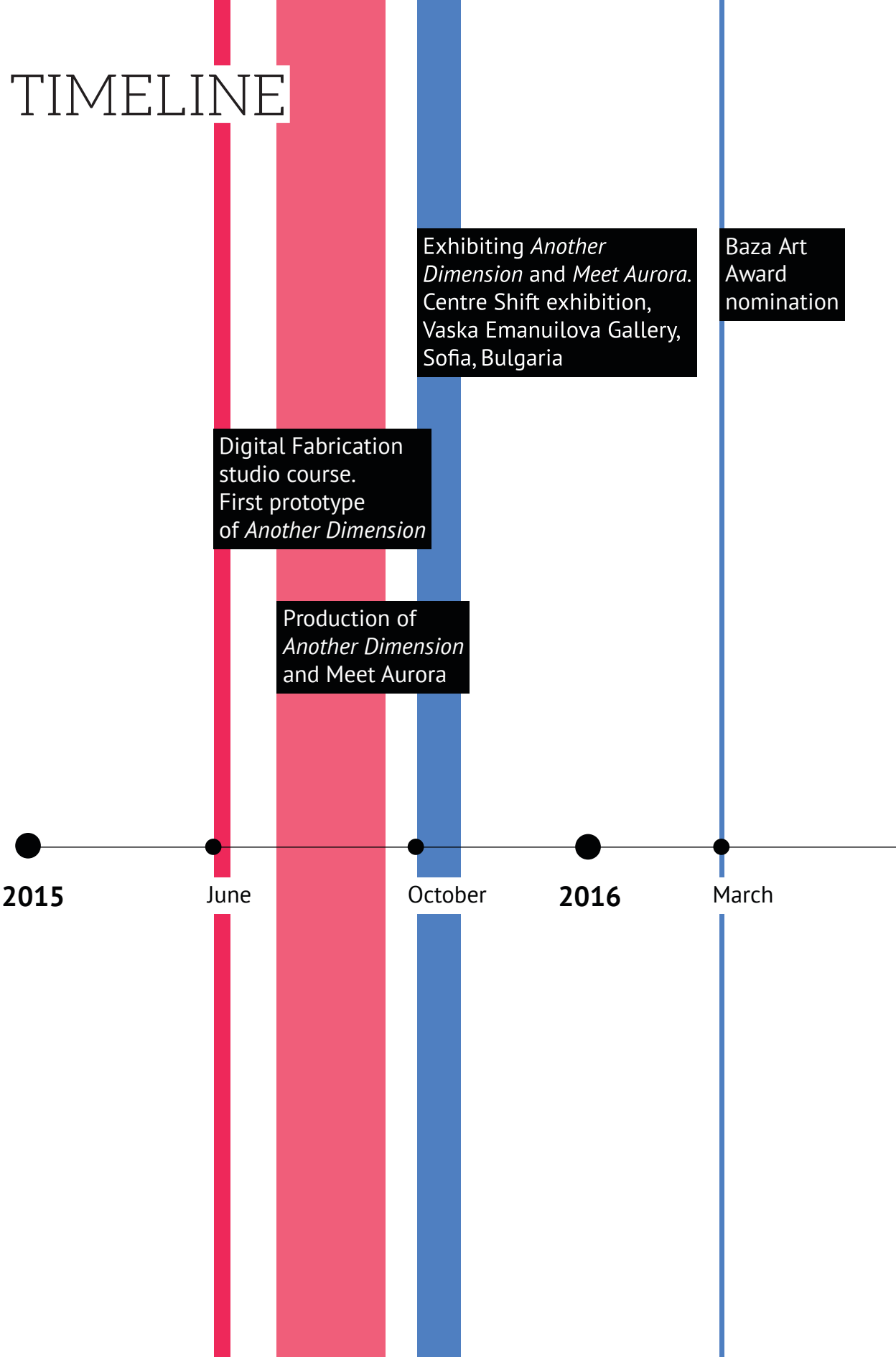
related to 3d printing of photographs, I would push the images more, until all recognisable shapes are gone in the volume. That would move the piece further away from photography, but would draw yet another interesting transformation - of the subject matter.

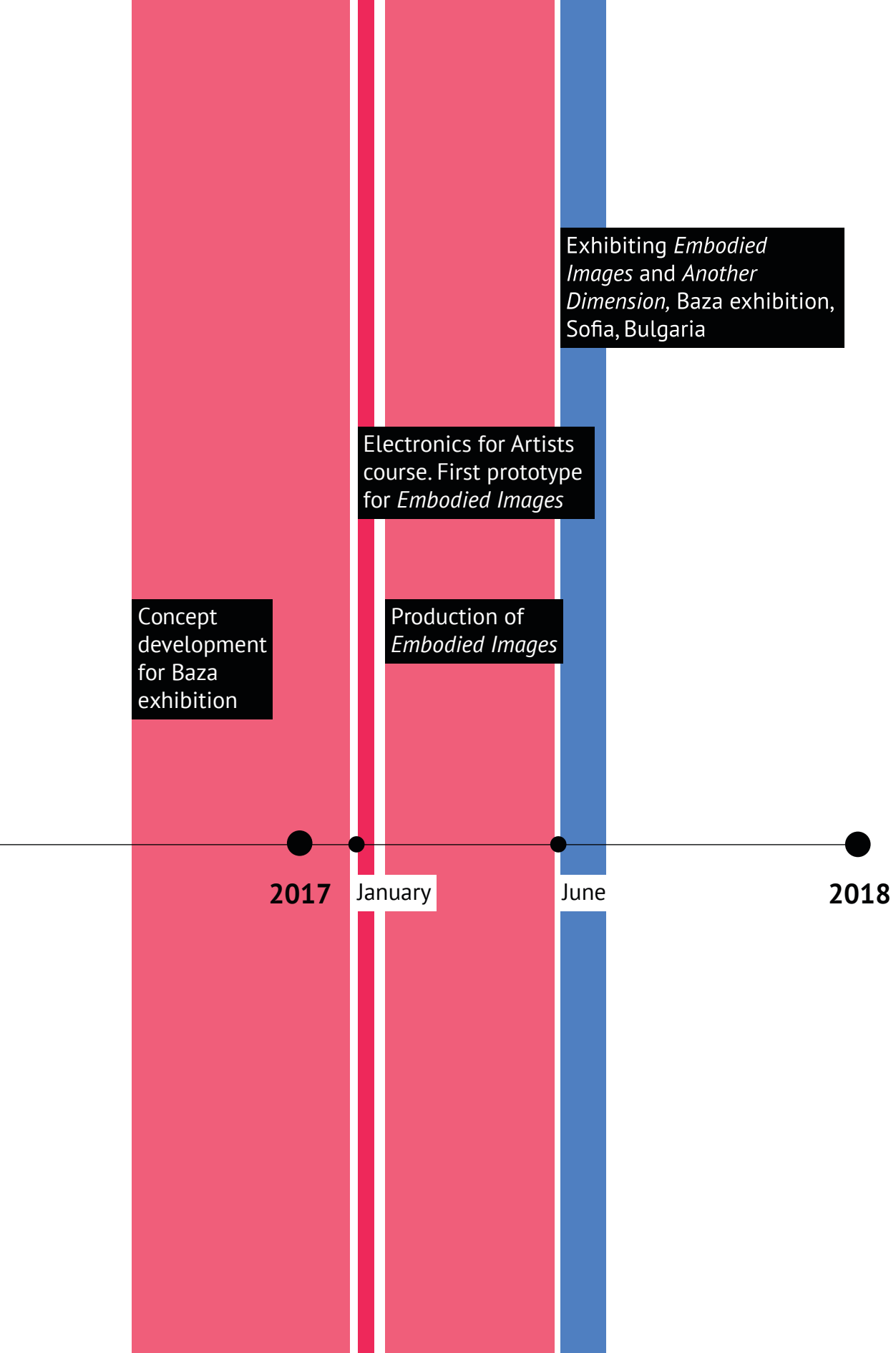
If I would start producing *Meet Aurora* once again, I would cut the Aurora curves separately from the plane. In this manner, it would be possible to make a bigger final object and obtain more detail. Apart from these purely technical remarks, works similar to *Meet Aurora,* which visualise a specific phenomenon or a viewpoint in an unfamiliar way, are very important to me. I find it vital for art in general, to be able to find and present as many perspectives as possible.

Embodied Images was a very promising undertaking and for future works I would go either in more abstraction in the subject matter and further develop the experience for interacting with light, or put more focus on the storytelling and connect series of light boxes in a single story. At the moment the work occupies a middle ground between these two directions.
The interaction ought to be developed further as well. I see a lot of potential in creating works which are still, and dynamic simultaneously, and interaction is one way to achieve that.

Generally, in case of enabling physical interactivity, in future I would conduct surveys with participants to determine what would be the best choices for a larger group of people.

TIMELINE


Exhibiting *Another Dimension* and *Meet Aurora*. Centre Shift exhibition, Vaska Emanuilova Gallery, Sofia, Bulgaria
Baza Art Award nomination
Digital Fabrication studio course. First prototype of *Another Dimension*
Production of *Another Dimension* and Meet Aurora
2015
June
October
2016
March


Exhibiting *Embodied Images* and *Another Dimension,* Baza exhibition, Sofia, Bulgaria
Electronics for Artists course. First prototype for *Embodied Images*
Concept development for Baza exhibition
Production of *Embodied Images*
2017
January
June
2018

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GLOSSARY

3D printing: also called additive manufacturing, a process in which a three-dimensional material shapes are formed from a digital image by adding layers of a specific material

CNC-milling: computer controlled process of a machine removing material from a piece in order to achieve a specific shape

digital fabrication: production process in which the machine is controlled by a computer

fab lab (fabrication laboratory): workshop space equipped to offer personal digital fabrication. Usually includes 3D printers, CNC-mills, laser and vinyl cutters and/or electronics workshop.

lithophane: a three-dimensional image which can only be seen clearly when lit from the back. In the classical sense a lithophane is made of very thin porcelain. Currently it is being referred to a type of 3D printed photograph

post-digital: a term, used in art discourse, marking processes and practices which deal with the relationship between the digital and the physical realm

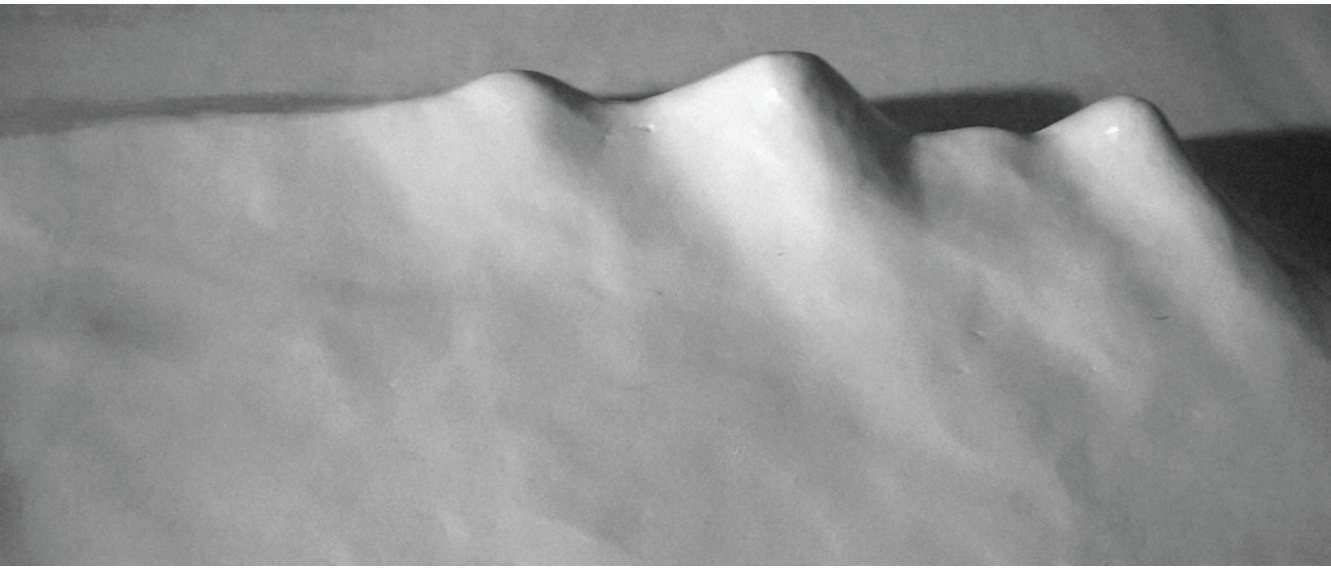
LIST OF FIGURES

Fig. 6.2: https://blogsimages.adobe.com/richardcurtis/files/2014/11/Tree-in-Key-Biscayne-Lithophane-1024x678.jpg

Fig. 7: http://galeriemax.com/wp-content/uploads/2013/11/RICHARD-DUPONT-UNTITLED-5-2008.jpg

Fig. 8: http://artievierkant.com/images/shows/2015_imageobjects_mf/vierkant_14375.jpg

Exhibition documentation of *Embodied Images* – ©Radostin Sedevchev. Documentation of *Another Dimension* and *Meet Aurora* – personal archive.



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